

Coneburn Residential Development

This report has been prepared for the benefit of Highlander Trust Ltd. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
	31 Jan 2019		Grant Kluyts	Richard Bennett	Peter White	Peter White

1 Introduction

The purpose of this report is to present an initial assessment of the feasibility of options for water supply and wastewater disposal for the proposed Coneburn Residential Development, immediately north of the Hanley's Farm development. Further investigation and discussions with QLDC will be needed to confirm the preferred service option.

Highland Trust Ltd are looking at developing up to 600 residential properties on the parcel of land shown in figure 1-1 below. The houses will mostly be 3 bedroom homes about 120m² of approximate 500m² sections.

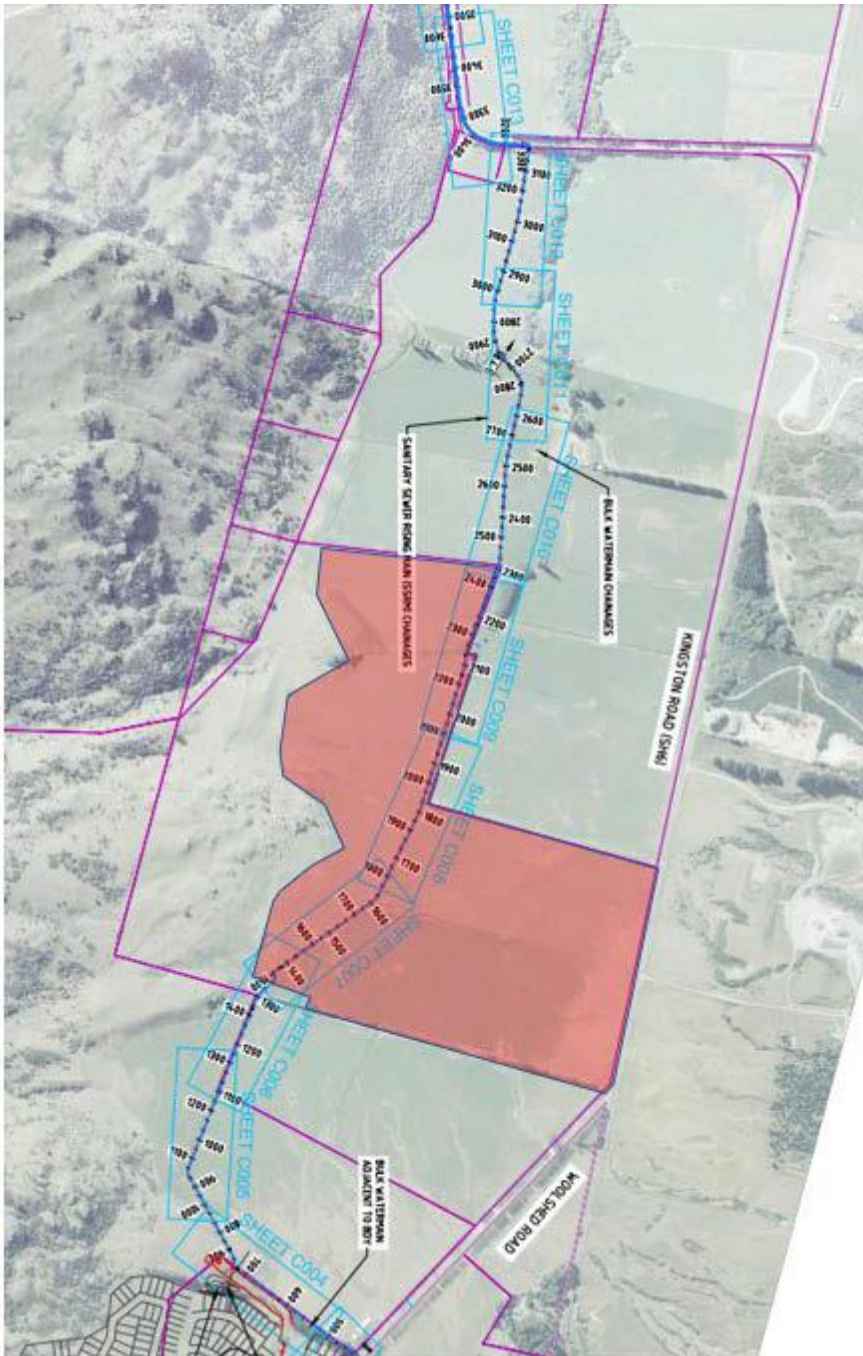


Figure 1-1: Parcel of land planned for development

2 Wastewater

2.1 Introduction

This section of the report covers how the development can be serviced for wastewater disposal.

The existing wastewater disposal networks that the development could possibly connect to are the following:

- The Hanley's Farm wastewater pump station just south of the development. This system will be vested with QLDC when it's completed during the first quarter of 2019,
- QLDC's receiving manhole on the Frankton Flats on the north side of the Kawarau River on Mountain Ash Drive near to the new Wakatipu High School.

It's assumed that the Coneburn Residential Development (CRD) will only come on line after QLDC has completed the construction of the bulk wastewater pumping main from the Frankton side of the Kawarau River Bridge to the receiving manhole on Frankton Flats on Mountain Ash Drive. Therefore the development's effect on the size of the interim pumps at the Hanley's Farm wastewater pump station is ignored.

It's assumed that all wastewater from the properties in the development will first be collected in a piped reticulated network within the development.

2.2 Potential Wastewater Servicing Methodology

Three possible wastewater servicing options have been considered for the purposes of assessing feasibility. There maybe other options or variations that are relevant to consider later during scoping or detailed design. It should be noted that all options are dependant on the agreement of Queenstown Lakes District Council (QLDC) as the owner of the downstream infrastructure.

2.2.1 Option 1 – Connection to Hanley's Farm system without upgrade

Pump wastewater from the CRD to the Hanley's Farm wastewater pump station. Wastewater is then pumped from Hanley's Farm wastewater pump station to the receiving manhole at Frankton.

2.2.2 Option 2 - Connection to Hanley's Farm system with upgrade

Pump wastewater from the CRD to the Hanley's Farm wastewater pump station. The Hanley's Farm pump system would be upgraded for the additional inflow with an online booster sytem with new pump station located part way along the rising main from Hanley's Farm to the receiving manhole at Frankton.

2.2.3 Option 3 – Dedicated new wastewater transfer system

A dedicated new wastewater transfer system to convey wastewater flow from the CRD direct to the receiving manhole at Frankton. This system could be enhanced to include flows from other future developments.

2.2.4 Other options identified but not considered feasible

A number of other options are recognised but not considered feasible for further consideration at this time:

- Connection to Willow Place Pump Station. This option was considered for the Hanley's Farm wastewater pump station but QLDC rejected it for consideration. Consequently, this option is not considered further.
- A new main along the same route as the Hanley's Farm bulk services pipelines. This alignment, particularly in the state highway, is very congested and as a result would most likely need to be located in the road carriageway. NZTA have been opposed to this for other projects in the past.
- Onsite treatment and disposal into the Jacks Point wastewater system. QLDC are generally in favour of reticulated wastewater treatment systems that discharge into their treatment plants and access to the system is dependent on the agreement of the owners. Therefore this option is is not considered here.
- New onsite treatment and disposal at CRD. A large area of land would be needed for an on-site disposal system and the soils on the site are not likely to be suitable. With the location of the stormwater channel nearby the likelihood of contamination is high. Further, QLDC are generally in favour of reticulated

wastewater treatment systems that discharge into their treatment plants. Therefore this option is not considered here.

2.3 Estimated Wastewater Generation

QLDC require that reticulated wastewater be disposed of in a safe and reliable way. They provide wastewater generated parameters which the system needs to convey without surcharging of manholes, pump stations etc.

The following design parameters for residential subdivisions are specified in QLDC's Land Development and Subdivision CoP.

- An occupancy of 3 persons
- A wastewater generation of 250 litres per person per day
- A dry weather diurnal peak flow factor of 2.5
- A dilution/infiltration factor of 2 for wet weather.
- 8 hours above ground emergency storage (based on Hanley's Farm approach)
- 1 hour below ground emergency storage (based on Hanley's Farm approach)

Table 2-1: Total flow and storage requirements for the CRD

Residential Lots	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
600	5.21	13.02	26.04
	Above Ground	Below Ground	
Storage	150m ³	19m ³	

2.4 Existing Hanley's Farm Wastewater Network

The Hanley's Farm wastewater pump station is ultimately designed to convey flow from Hanley's Farm and Jacks Point developments up to a total of 2800 residential units. The pump station capacity is currently restricted to 1000 residential units due to a downstream network hydraulic capacity constraint. QLDC are currently undertaking upgrade works to remove the hydraulic capacity constraint. Wastewater is pumped from the Hanley's Farm wastewater pump station through a dedicated bulk pumping main to the Kawarau River Bridge where it converges with the pumping main from the Willow Place pump station and currently discharges into Frankton Beach pump station. The upgrade works mentioned above consists of a new 500mm OD pumping main to the receiving manhole in Mountain Ash Drive and hence bypassing Frankton Beach Pump Station.

The Hanley's Farm wastewater pump station and pumping main to the Kawarau River Bridge is designed for 122 l/s, which is the maximum flow contribution from the planned 2800 Lots from Hanley's Farm and Jacks Point. This capacity must be maintained for Hanley's Farm and Jacks Point, and is not available for CRD.

The hydraulic capacity and system characteristics of the downstream system post implementation of the upgrade works is not known and shall be confirmed by QLDC. This is required to confirm the final Hanley's Farm pumpset selection for 2800 residential units, and also to determine whether a larger pumpset to serve the CRD can be accommodated within the Hanley's Farm wastewater pump station.

2.5 Wastewater Servicing Disposal Options Assessment

The primary options for wastewater disposal are discussed in the table below.

Table 2-2: Wastewater Disposal Options, Issues and Next Steps

Option No	Option description	Discussion	Conclusions
1	<p>A new wastewater pumping transfer system from the CRD to Hanley's Farm wastewater pump station. Wastewater is then pumped from Hanley's Farm wastewater pump station to the receiving manhole at Frankton</p>	<p>Ground levels at the CRD are lower than at the Hanley's Farm pump station. A pump station is needed at the development to lift wastewater to Hanley's Farm. Flow into the Hanley's Farm pump station will increase with CRD connecting. The duty point (flow and headloss) for the pump station at Hanley's Farm will consequently increase. A larger pump may be needed. At this stage there is insufficient information to confirm that is is feasible to install a larger pumpset in the Hanley's Farm wet well. Key difficulties are:</p> <ul style="list-style-type: none"> - Whether it is possible to source a pump with sufficient capacity - Whether there is enough hydraulic capacity in the downstream pipeline system - Wet well size needed - Power supply for larger pumps - Pipeline pressure rating ability to manage the additional head from the larger pumps. <p>If a bigger pump cannot be obtained or the hydraulic capacity of the downstream system is not sufficient, then this option is not feasible. Other factors can be overcome by various technical solutions.</p> <p>Pipeline corridor from CRD to Hanley's Farm wastewater pump station will need to cross private land (therefore subject to negotiations and agreements with land owners) or take a longer route along Woolshed Road.</p> <p>The requirement for additional emergency storage can be provided by the installation of additional below ground tanks similar to the current tanks at Hanley's Farm. The 30m³ flushing tank at Hanley's Farm wastewater pump station site may be available as emergency storage in the future. Emergency storage could also be provided within the CRD site at the new pump station positioned at the low point in the reticulated network.</p>	<p>The feasibility of this option is subject to consideration of technical issues including:</p> <ul style="list-style-type: none"> - Confirm pump duty points - Confirmation of capacity of downstream system - Pump selection - Pipeline pressure rating <p>Next steps should include confirmation with QLDC on the above, and other relevant design details.</p>

Option No	Option description	Discussion	Conclusions
2	<p>A new wastewater pumping transfer system from the CRD to Hanley's Farm wastewater pump station. The pump system upgrade at Hanley's Farm will consist of an online booster sytem with new pump station located part way along the rising main from Hanley's Farm to the receiving manhole at Frankton</p>	<p>If it is not technically feasible to implement option 1, a second pump station part way along the existing rising main from Hanley's Farm would provide a way to increase the capacity of the system.</p> <p>There are a number of technical details to confirm but likely to be solveable using normal design solutions. Whether this option is feasible is dependant on whether a suitable site for the new pump station can be found and agreed with QLDC.</p> <p>From a hydraulic perspective the most likely optimum location is considered to be to the north side of the Kawarau River Bridge. Key issues for consideration of a pump station site are:</p> <ul style="list-style-type: none"> - - service congestion - - availability of land (private or road reserves) - - availability of power - - odour management 	<p>At this stage this option appears to be technically feasible. The next step is to identify whether there are possible pump station sites. To do this it is first necessary to confirm:</p> <ul style="list-style-type: none"> - Confirm pump duty points - Confirmation of capacity of downstream system <p>Discussion will be needed with QLDC on these points.</p>
3	<p>A dedicated new wastewater pumping transfer system to convey wastewater flow from the CRD direct to the receiving manhole at Frankton. This system could be enhanced to include flows from other future developments.</p>	<p>This option is technically feasible but likely to be the most expensive. It will require the following components:</p> <ul style="list-style-type: none"> - New pump station - Emergency storage - Power supply - Odour treatment - New pipeline - New river crossing <p>We are aware that a new bridge crossing across the Kawarau River has been suggested previously. Implementation of a new bridge would make this option more attractive.</p> <p>This option also has the potential to best cater for other future developments in this area.</p>	<p>This option may provide a better long term benefit to the whole area and should be discussed with QLDC.</p>

3 Water Evaluation

3.1 Introduction

This section of the report covers how the CRD could be serviced with potable water. Houses are assumed to be single story family homes with no sprinkler systems.

QLDC's Kelvin Heights or Shotover Bores Potable Water Schemes could possibly supply the CRD. A QLDC bulk water main from the Kelvin Heights Water Scheme that supplies Hanley's Farm crosses the area of CRD.

3.2 Potential Water Servicing Methodology

Three possible potable water servicing options have been considered for the purposes of assessing feasibility. There may be other options or variations that are relevant to consider later during scoping or detailed design.

3.2.1 Option 1 – Connection to the existing bulk water main from Kelvin Heights

Connect to the existing bulk water main running through the CRD area.

3.2.2 Option 2 – A new reservoir and new booster pump station

A new reservoir on a site near the development, with a new booster pump station that conveys water from the existing bulk water main to the new reservoir, and then a new falling main to supply the CRD.

3.2.3 Option 3 – A dedicated new potable water transfer system

A dedicated new potable water transfer system to the CRD direct from QLDC's potable water reticulated network in Frankton Flats. This network is served by the QLDC's Shotover Bores Potable Water Scheme.

3.2.4 Other options identified but not considered feasible

Other options are recognised but not considered likely to be feasible for further consideration at this time:

- Connection to the Coneburn Potable Water Supply Scheme. It is known that this scheme has no surplus capacity so is not considered further.
- A new potable water source with headworks and conveyance systems. This option is dependant on being able to find a new water source from a bore on the CRD land or nearby) and will be the most expensive. It is also preferable for ongoing management and quality of supply to use existing supplies if possible rather than create a new source and treatment process. It is not considered further.

3.3 Water Demand

The water supply system for a new development must comply with QLDC's Code of Practice (CoP) and the New Zealand Fire Service Firefighting Water Supplies Code of Practice. The following levels of service are applicable:

- Residual pressure during the Peak Hour Flow shall be at least 300kPa.
- Class FW2 fire flow is available to meet the required Queenstown Lakes District Council standards.
- Pressures during $\frac{2}{3}$ of Peak Annual Flow plus Fire Fighting is at least 100kPa for FW2 fire flows

QLDC's CoP specifies that demand calculations for domestic water supply are based on demand criteria for residential units of 700 litres per person per day, with occupancy of 3 persons per lot for the Average Daily Flow (ADF) in litres per second, and Peaking Factors of up to 6.6 for instantaneous demand. This is overly conservative for the type and scale of domestic dwellings and lower assumptions for demand agreed previously with QLDC for Hanley's Farm can be expected to apply for the CRD.

The criteria at Hanley's Farm used in previous modelling and design are:

- Demand of 1000 litres per lot per day for the Average Daily Flow (ADF). QLDC undertook a flow metering study to arrive at this flow rate and found it more representative of actual flows.
- The Peak Daily Flow (PDF) in litres per second is calculated by multiplying the ADF by a peaking factor of 2.0
- The Peak Hour Flow (PHF) in litres per second is calculated by multiplying the ADF by a peaking factor of 4.0

Table 3-1: Water Supply Domestic Demands using the criteria for Hanley's Farm

Residential Lots	ADF (l/lot/day)	ADF (l/s)	PDF (l/s)	PHF (l/s)
600	1000	6.94	13.89	27.78

The firefighting flow plus two thirds of the peak annual demand is shown in the table below. The calculation of the peak annual demand is taken from the Firefighting CoP.

Table 3-2: Firefighting flow

Firefighting Flow - FW2 (l/s)	Peak Annual Demand (l/s)	2/3 rd Peak Annual Demand (l/s)	Firefighting Flow + Domestic demand (l/s)
25	34	23	48

3.4 Existing Water Networks

A pipeline from the the Kawarau River Bridge conveys water from QLDC's Kelvin Heights Potable Water Scheme to the Hanley's Farm Development. This pipeline runs through the CRD. It is designed for 2000 lots but this capacity is already committed to Hanley's Farm and Jacks Point developments. There is no spare capacity for the CRD in this supply without upgrades to the Kelvin Heights water supply scheme.

QLDC's Shotover Bores Water Supply Scheme serves Frankton and the surrounding areas. The precise capacity of this scheme is not known but it is understood there are also limitations to the capacity of this scheme to supply all potential demand.

We also understand that QLDC are investigating a number of scenarios to upgrade the Kelvin Heights and Shotover Bores water schemes, both to meet current demands others to meet the needs of development growth

The potential capacity of these schemes shall be confirmed by QLDC.

.

3.5 Water Supply Servicing Options Assessment

The primary options considered for potable water supply are discussed below.

Table 3-3: Water Supply Options, Issues and Next Steps

Option No	Option Description	Discussion	Conclusions
1	Connect to the existing bulk water main that runs through the development and is supplied from QLDC's Kelvin Heights Water scheme.	<p>Connecting CRD to the bulk water main:</p> <ul style="list-style-type: none"> - will lower water pressures in Hanley's Farm and Jacks Point, - use water already committed to existing consumers and those already in QLDC's plans for known future developments. <p>A connection to this pipeline to serve CRD is therefore not possible without suitable upgrade of the upstream system.</p> <p>It's known that the Kelvin Heights Water Scheme has capacity and pressure limitations, which is understood to be at the intake, reservoir and bulk supply pipelines. QLDC are looking at several options to upgrade this water scheme to meet their levels of service to existing consumers while building in reserve capacity to cater for new consumers from future developments.</p> <p>Although the capacity of the headworks and bulk supply infrastructure of the Kelvin Heights Water Scheme are not known, QLDC plans to upgrade this scheme could include demands for the CRD.</p>	<p>The feasibility of this option is subject to the inclusion of CRD demands in QLDC's plans to upgrade the Kelvin Heights Water Scheme.</p> <p>Discussion is needed with QLDC to confirm whether the planned upgrades can accommodate the CRD.</p>
2	A new reservoir on a site near the development. A new pump station that conveys water from the existing bulk pipeline to the reservoir. A new falling main to supply the CRD.	<p>This option would also connect to QLDC's Kelvin Heights Water Scheme.</p> <p>This option has an advantage in reducing the peak supply rate needed from the existing bulk pipeline to service CRD (because of the spreading of demand variation through the new reservoir) and therefore reducing the potential draw on the QLDC supply.</p> <p>This option proposes that a new reservoir be built in the vicinity of the Hanley's Farm Development, with pump station to fill it and falling main to supply to the properties it serves. The reservoir location would need to be on elevated ground to the east (on the Remarkables) or west of the CRD area (i.e. requiring use of land owned by others)</p>	<p>The feasibility of this option is subject to the inclusion of CRD demands in QLDC's plans to upgrade the Kelvin Heights Water Scheme.</p> <p>Discussion is also needed with QLDC to confirm reservoir size and location. Access to land with a suitable elevated site would be need to be negotiated.</p>

Option No	Option Discription	Discussion	Conclusions
		<p>This approach will increase pressures and emergency storage within the water supply and buffer peak flows, thereby potentially improving the Kelvin Heights Water Scheme to meet QLDC's levels of service. The reservoir could be filled at night when demand in Hanley's Farm is low.</p> <p>This option could therefore contribute to the wider upgrade of QLDC's supplies, while servicing CRD.</p>	
3	<p>A dedicated new potable water transfer system from the CRD direct to QLDC's potable water reticulated network in Frankton. This network is served by the Shotover Potable Water Scheme.</p>	<p>Currently water is conveyed from the Shotover Bores Potable Water Scheme to Frankton and surrounds. This scheme also supplements flows to the Kelvin Heights scheme when demand is high . QLDC are looking at a number of upgrades to the Shotover Bores Water Scheme to potentially supply to future developments in the Hanley's Farm/Jacks Point area. These upgrades may be in addition to or instead of those for the Kelvin Heights scheme. QLDC could include the additional demands from CRD in their upgrades.</p> <p>This option is technically feasible using conventional engineering solutions. It will require the following components:</p> <ul style="list-style-type: none"> - New pipelilne from Frankon to CRD - New river crossing <p>We are aware that a new bridge across the Kawarau River near Boyd Road has been suggested previously. Implementation of a new bridge would make this option more attractive.</p>	<p>The feasibility of this option is subject to investigation of the capacity and pressure requirements of the Shotover Bores Water Scheme. Confirmation of this is needed from by QLDC</p> <p>This option may provide greater long term benefit in servicing other areas, which should be discussed with QLDC.</p>

4 Conclusion

This initial assessment has determined that it is feasible to service the proposed CRD development with a water supply and wastewater disposal system by connection to existing public municipal infrastructure. However, upgrades to those public systems would likely be needed to accommodate the CRD.

Further investigation will be needed to confirm the feasibility of some options and then the best approach. This will need to include early discussion with QLDC on how servicing the CRD could be included in QLDC's planning for water and wastewater infrastructure upgrades.